EARLY SYMPTOMS OF POLIOMYELITIS WITH SPECIAL REFERENCE TO A NEW PREPARALYTIC SYMPTOM.*

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We have just emerged from an epidemic of "Infantile Paralysis," practically the first, at least the largest, we have experienced in Southern California. History shows that epidemics have been spreading in the line of travel and it finally came our turn. With our enormous immigration it is a wonder we have escaped so long and the chances are we shall have another next year. In anticipation of this let us be ready by studying well our own situation, according to each man's experience, as each epidemic differs somewhat from the others.

The most difficult and interesting part of the practice of medicine is the early diagnosis of our cases. The most satisfactory part to the patient is to be cured or to be given a correct prognosis. The earlier we can diagnose our cases the greater the hope of cure and the better our prognosis. In the recent epidemic we all noticed many interesting cases and running through these was a chain of classic symptoms. In addition to these there were other symptoms which seemed to be characteristic of the preparalytic stage. I will deal largely with this preparalytic stage and lay especial stress on the symptoms which have not heretofore been emphasized or reported, and cite cases illustrating the different varieties of the disease.

Infantile Paralysis a Misnomer.—In order to get a better understanding of the subject let us review our teachings of infantile paralysis. Our knowledge of the disease has been rapidly undergoing a change. Not long ago the diagnosis of the disease was based wholly on the paralysis. Osler in 1900 said, "Child after slight indisposition and fever is noticed to have lost use of a limb." Holt about the same time said, "No diagnosis can be made until the paralysis takes place." Up to five or six years ago to report a case of paralysis with recovery was looked upon with about as much doubt as recovery in tuberculous-meningitis. A few years ago to have reported a case that never had paralysis would have been looked upon with as much doubt as to have reported a case of an adult having had infantile paralysis. This disease which for years was thought to be characteristic of infancy has to-day, as we all know, many victims among adults. It is also a common observation now to have perfect use of the muscular system throughout the attack. Therefore inasmuch as the disease is neither infantile nor paralytic the name infantile paralysis is a misnomer. The term "anterior poliomyelitis" has likewise been found incomplete.

Anterior Poliomyelitis Not Characteristic of the Disease.—As a close study of the numerous phases of the disease has shown that instead of the involvement being confined to the spinal cord and the anterior horn portion at that, we may have the posterior horn as well as any other part or whole of the cerebro-spinal system attacked. The involvement of the posterior portion is shown in two ways, first, by early symptoms of hyperesthesia of the skin, and second, by the loss of sensation in certain localities. The involvement is not confined to the cord as was first brought out in 1905 by Medin and emphasized last year by Koplik in his articles on the cerebral forms of poliomyelitis. Thus we have instead of local involvement of the cord, symptoms of involvement of the whole cerebro-spinal system.

Not a Nervous but an Infectious Disease.—Up to a year or so ago infantile paralysis was considered and classified as a nervous disease. This view or theory was first upset by Landsteiner and Popper, who, in 1909, inoculated successfully a monkey from the spinal cord of a child dead of poliomyelitis. They thus demonstrated positively that it was an infectious disease. Later Flexner, Lewis, Osgood and others showed that the virus affected not only all parts of the nervous system but the lymphatic and vascular systems and the parenchyma of various organs. Thus "infantile paralysis" is not strictly an infantile disease, or a paralytic disease, and lastly not a nervous disease. It is an infectious disease.

The name of the disease may be changed some day but the symptoms of the disease will always be referred to the nervous system. Thus the diagnosis will be largely based upon symptoms originating from the pathological changes in the cerebro-spinal system.

Varieties of the Disease.—The various kinds of poliomyelitis will best be separated by considering their relation to the divisions of the cerebro-spinal system, which are, as we all know, the cerebral, bulbar or spinal. The bulbar includes the cerebellum or ataxic variety, and is further subdivided into superior and inferior types. The spinal includes the Landry's type. In addition we have the abortive type, which may simulate any one or all of the above. Another class will be reported which is neither abortive nor corresponding to any one of the above types.

Wickman's classification is the same as above only he adds polyneuritic and meningitic types.

The diagnosis of the different varieties of poliomyelitis in the preparalytic stage is an impossibility at the present, and, as Koplik says, even in the paralytic stage a positive diagnosis only can be made with careful observation and then with some degree of doubt. The clinical symptoms of the preparalytic stage are common to all varieties and may be grouped under the heads of constitutional and nervous.

Constitutional Symptoms Same as an Infectious Disease.—The constitutional symptoms are those of almost any infectious disease. In infancy and childhood it is generally ushered in by sudden onset usually with digestive disturbances. Vomiting and constipation or diarrhea with tympanites is very often present. More or less fever is present with increased pulse rate, together with general prostra-

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tion. This is associated with peevishness and irritability and occasionally but rarely with convulsions. A. H. Brown mentions a petechial skin eruption as characteristic. I have seen it but once. In older patients we have the same, with headache and aching limbs, anorexia, fever and at times delirium. None of these symptoms are diagnostic and as you all know may be present in almost any infectious disease.

Nervous Symptoms Simulate a Meningitis.—The nervous symptoms are characteristic of a meningitis. The irritability becomes more pronounced and the skin becomes extremely hypersensitive. This is perhaps the most constant and important early symptom. The reflexes are more active, later sluggish and finally lost entirely. I have found that occasionally the absence of knee jerk or abdomen reflexes precede the paralysis and was about the only suggestive sign. We have some change in cerebration and complaint of difficulty in getting chin down on the chest. The back is also stiff, sitting up in bed is difficult, and the gait is changed.

There is also some localized sweating which I have classified as a nervous symptom, and which is no doubt due to disturbances of sweat center or vasomotor control. Echert considers the sweating one of the most important symptoms.

In addition to these we have the symptom of pain. According to most authors this is a most common and almost constant symptom, but it has not been my experience to find it so important, because it is a common belief among the laity that "infantile paralysis" is preceded by pain. This causes the parents in their great anxiety and fear of the disease to suggest this symptom, thus often making the report of it so vague and indefinite that it has caused me more or less to disregard it in children.

Another symptom, very suggestive when properly associated, is lack of usual co-ordination. Frequently the first symptom noticeable is that the child falls easily, knocks things off the table or cannot get food to the mouth easily when eating, or has difficulty in handling objects.

So far all the symptoms are recognized by the best authorities as being characteristic of the early stage of poliomyelitis and when properly co-ordinated they are very suggestive, but without the paralysis, it is impossible to diagnose your case, unless a lumbar puncture is made and even then there may be some degree of doubt.

A New Preparalytic Symptom: There is one symptom which so far I have not mentioned which to me in this epidemic has been of great assistance in making a preparalytic diagnosis. The symptom is not mentioned in any text book, nor can I find reference to it in the recent literature.

As I stated in the beginning every man's experience is different and every epidemic is different and brings forth some new symptom or adds some new knowledge. The symptom I am about to describe may or may not have been met in your experience and it is for the purpose of getting your criticism and stimulating discussion that I am influenced to emphasize it.

The symptom referred to is a peculiar twitching tremulous or convulsive movement of certain groups of muscles lasting from a very few seconds to less than a minute. The amplitude of vibration is greater than a tremor, not so constant and long as a convulsion, and more regular than mere twitching, yet it has in it some of the elements of all. It usually affects a part or whole of one or more limbs, the face or jaw, but it may sometimes affect the whole body. The symptom may easily be overlooked in the beginning as it usually lasts less than a second and does not recur, unless the patient is disturbed, oftener than every hour or so. Later the duration of the spells lengthens, first to a few and then several seconds; at the same time the intervals between become shorter. This condition is often accompanied by a peculiar cry similar to the hydrocephalic. At times there is a slight convulsive movement just like a chill, as mothers say, during which time the child is apparently unconscious with eyes set for a few seconds and then he apparently becomes perfectly normal again. This short unconscious spell with eyes set may occur without noticeable convulsive movements. It acts thus something like a *petit mal.* I have observed it as a twitching of the lips with tongue running in and out and working of jaw, preceding bulbar cases.

Resemblance to Strychnin Poisoning: The phenomena resemble the condition found in cases of strychnin poisoning only the tetanic contractions are not general and do not last for a long time. They usually involve a set of muscles with one or more of the counter muscles not affected. Hypersensitiveness of the skin is also similar. The least stimulation of the skin is followed by slight convulsive movements with rigidity of the arms with fingers separated and wrist flexed. When the patient turns in bed, either through the external stimulus or the effort to co-ordinate, the movements are quick and jerky accompanied usually with slight convulsive movements of the limbs.

Simulates Infection Neuroses: It seems to be similar to the infection neuroses described by neurologists, of which tetany and chorea are good examples. It also simulates a tic and *petit mal* and yet it is unlike all of these. It is not unreasonable to suppose that the presence of the virus of poliomyelitis may bring about effects similar to those of chorea and tetany. A local chemical or other irritation of the nervous centers is produced with subsequent fatigue and later recuperation resulting in the peculiar motor phenomena I have described as a preparalytic symptom.

The only reference found to this symptom in the literature is made by Wickman, Zappert, and Wilbur. Wickman observed one phase of it and but once in his many cases, while Zappert and Wilbur observed only the muscular twitching in limbs. No one so far as I can learn has described the symptom I have just given you. I have not worked out to my satisfaction the relation of local twitching to paralysis.

Explanation of New Symptom: Having once observed this phenomenon which I took to be a

common symptom, until I began to look it up, I set out to find an explanation. Let us digress and review the condition found in the preparalytic stage. According to the best authorities (Flexner, Lewis, Draper, Peabody and others), during this early stage we find the spinal fluid containing great quantities of the virus, which disappears more or less as soon as paralysis sets in. With this we have an increase in spinal pressure. The fluid is not an exudate like lymph but a secretion from the choroid plexus, no doubt stimulated by the virus. The cells in the whole cerebro-spinal system are bathed by a fluid containing a toxin under increasing pressure. This throws the ganglia and cells into a highly excited state. Some areas are attacked more than others and we have a series of explosive contractions followed by rest similar to the artificial chemical excitation with fatigue manifested in a muscle-nerve preparation.

I have thus endeavored to explain the cause of the tremulous twitching, convulsive *petit mal* phenomena. Now how can their peculiar local distribution be explained? And how can we explain the lack of co-ordination and the escape of one or more counter muscles? As you remember, the virus attacks not only the nerve tissue but also the vascular system. John Lovett Morse says that there is interference with the blood supply in the cord resulting from inflammatory processes in the vessel wall. Hemorrhages, large and small, into the cord are not uncommon. The blood supply in the cord is horizontal while the nerve supply to a group of muscles is not all derived from the same segment. We have the cord affected in some segments while others escape, thus accounting for the peculiar distribution and lack of co-ordination. This condition is always noticeable in the convalescence. I have seen cases where the children had to learn to walk and feed themselves again, and others must learn again to talk.

Spinal Fluid in Preparalytic Stage: Finally it is important to mention the condition of the spinal fluid as of preparalytic diagnostic value. Some investigators find the fluid clear and slightly opalescent, under increased pressure. It contains increased polymorphonuclear cells and reacts to the protein reaction with Noguchi butyric acid test. By most authors this is considered the only reliable preparalytic test, and it is open to question.

THE EFFECTS OF CIVILIZATION UPON OUR EYES.*

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With almost periodic regularity we meet with reports of the deleterious results that errors of refraction have upon the mental and physical well-being of our school children.

Refractive errors of a half and even a quarter of a diopter are credited with the production of tortiocollis, chorea, epilepsy, hysteria, hallucinations, maniacal temper, moral perversity, etc., etc. We are constantly warned that we are in grave danger of being converted into a race of myopes. We have for years been taught that the demands of our educational system are gradually changing the hyperopic eye of infancy, decreasing the amount of hyperopia in the primary grades, until approximately fifty per cent. are myopic in the higher grades of high school. This change is supposedly effected by a progressive stretching of the tunics of the globe until the small eye of the hyperope, becomes the large eye of the myope. This is a pathological condition just as surely as a dilated heart is pathological.

If the above assertions be true, the outlook for humanity would be gloomy indeed. With the advance of civilization comes an ever increasing demand upon the eyes. Literature is cheaper and more easily obtained. Public libraries are increasing in number and more accessible. Even the moving pictures make an additional demand upon the eyes of considerable magnitude.

The question to be answered—Are our eyes actually giving out under the stress of advancing civilization, or is nature asserting itself and meeting the demands?

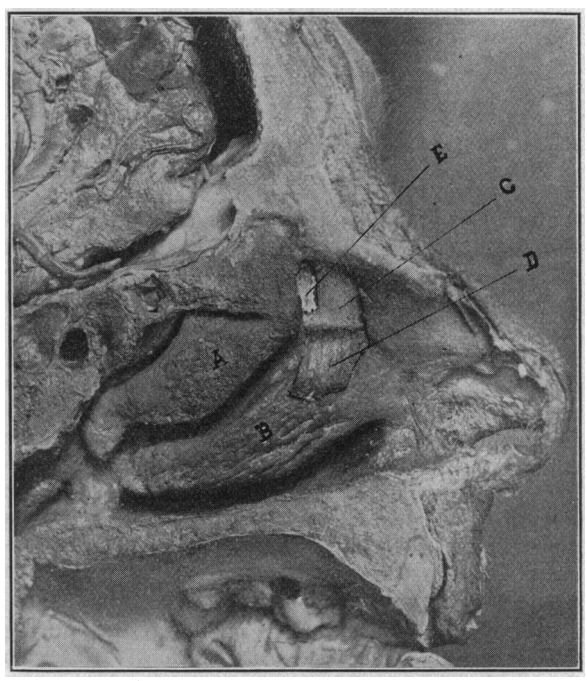

Fig. I. (A) Middle turbinate. (B) Inferior turbinate. (C) Lateral bony nasal wall. (D) Muco-periosteol flap turned down over inferior turbinate. (E) Lacrimal sac.

Is it not barely possible that our reasoning has been faulty, and our fears groundless. It seems that we have overlooked nature's adaptability to changing conditions. Nature's dictum appears to be that organs rendered useless by the habits of life shall eventually degenerate. As examples we recall our rudimentary auricular muscles, the appendix, the wisdom teeth, etc. The reverse is also true; namely, increased use of organs results in their greater development. As examples again may be mentioned the hypertrophy of the heart in impeded circulation or the hypertrophy of one kidney when the other becomes functionless. Numerous other examples will suggest themselves

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